

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problems Mailbox.**

(12) UK Patent Application (19) GB (11) 2 155 276 A

(43) Application published 18 Sep 1985

(21) Application No 8415455

(22) Date of filing 18 Jun 1984

(30) Priority data

(31) 585451

(32) 2 Mar 1984

(33) US

(51) INT CL<sup>4</sup>  
H04R 25/00

(52) Domestic classification  
H4F 30A 32E AA

(56) Documents cited  
GB A 2098426

GB 1142831

(71) Applicant

Beltone Electronics Corporation (USA-Illinois),  
4201 West Victoria Street, Chicago, Illinois 60646, United  
States of America

(72) Inventors

Richard Brander,  
Mark F. Stanton

(74) Agent and/or Address for Service

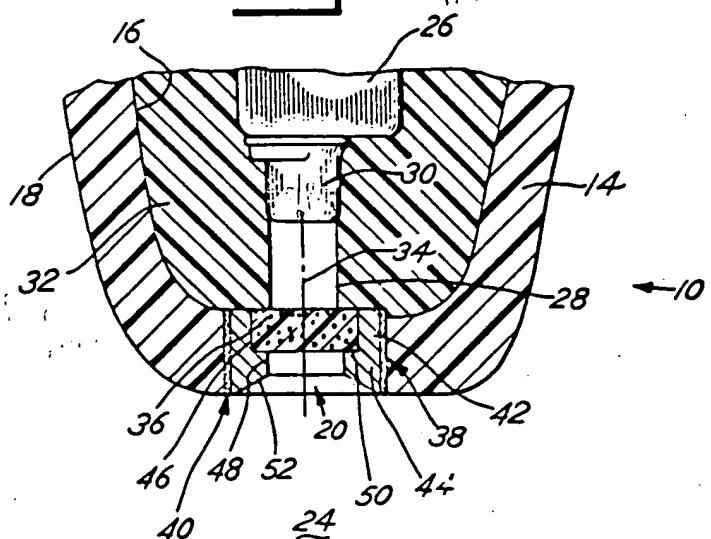
Lloyd Wise Tregeair & Co.,  
105-109 Strand, London WC2R 0AE

(58) Field of search  
H4J

(54) Hearing aid ear piece with wax  
guard

(57) A hearing aid ear piece having a  
wax guard (36) to prevent earwax from  
contacting and damaging the internal  
components of a hearing aid. The guard  
is fitted between a receiver (26) and a  
hearing aid port (20) in an ear piece  
shell (14) and the guard is formed of a  
pliant material suitably foam. The pliant  
guard allows sound to pass out of the  
hearing aid, but substantially prevents  
earwax from entering the sound  
channel.

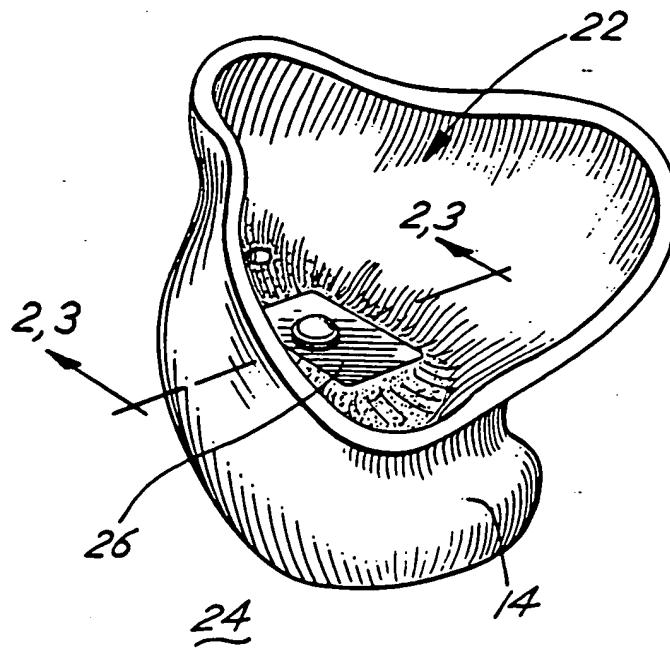
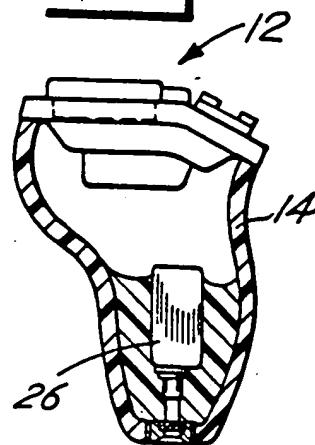
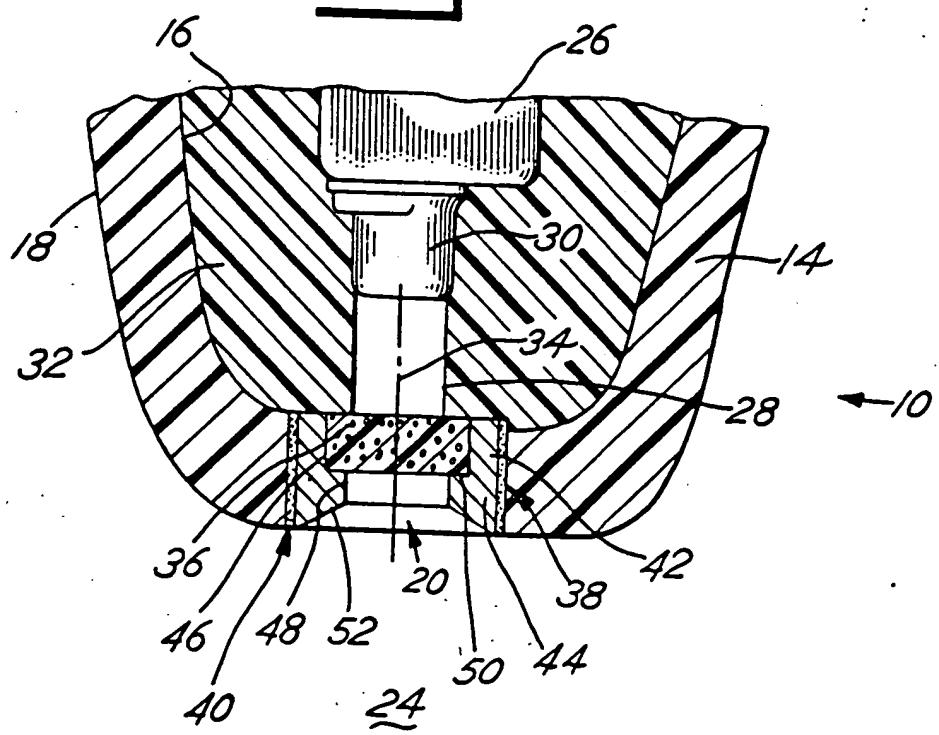
Fig. 3



GB 2 155 276 A

**Fig. 1**

1 / 1

**Fig. 2****Fig. 3**

**SPECIFICATION****Improvements in and relating to hearing aids**

5 The present invention relates generally to hearing aids and more particularly to an ear piece for a hearing aid.

Many hearing aids include a shell that holds the components of the hearing aid and rests within the ear canal of a user. The components include a receiver and a sound channel interconnecting the receiver and shell. Electrical signals representative of the sounds are sent to the receiver by other components within the hearing aid, and the receiver responsively creates sound. The sound travels from the receiver, through the sound channel and shell, to the user's ear canal and ear drum.

The ears of most users naturally secrete a substance referred to as cerumen or earwax. While the earwax tends to clean the internal structure of an ear, it also tends to flow into the sound channel and receiver of the hearing aid. Upon reaching the receiver, the earwax interferes with, or prevents, proper operation of the receiver.

25 Consequently, the hearing aid may require complete disassembly so that the receiver may be cleaned or replaced. Of course, bringing the hearing aid to a service centre for disassembly is both inconvenient and expensive for the user.

30 Unfortunately, presently available systems are poorly suited to guard against earwax build up in the sound channel and receiver of a hearing aid. Some hearing aids, for example, have no protection against earwax. Other conventional systems 35 may use a rigid metal screen that is ineffective in stopping the flow of earwax into the receiver and must be carefully cleaned periodically with a special tool.

A hearing aid piece according to the invention 40 comprises a shell having an exterior surface and an interior surface about an interior cavity, a hearing aid port between the exterior and interior surfaces, a receiver within the cavity, the receiver having an acoustic output port, a sound channel 45 between the ports, a pliant guard in the hearing aid port allowing sound to pass and substantially preventing wax from passing along the sound channel, retainer means around the hearing aid port to retain the guard in the hearing aid port and 50 to allow removal of the guard from the hearing aid port.

Advantages of the ear piece of the invention are that a cost and technically effective guard is provided to guard the receiver against wax. The construction enables removal of a soiled guard, its disposal and replacement.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:-

60 *Figure 1* is a perspective view of the hearing aid shell and receiver used with the present invention;

*Figure 2* is a cross-sectional view (taken substantially along line 2-2) of the preferred embodiment of the present invention of *Figure 1*; and

65 *Figure 3* is an enlarged cross-sectional view

(taken substantially along line 3-3) of the sound channel, pliant guard, and retainer ring of the preferred embodiment shown in *Figure 2*.

Referring to Figures 1 - 3, the preferred embodiment of the present invention is shown as an improved ear piece, generally designated 10, for "in the ear" or "canal" type hearing aids, illustratively designated 12.

Such hearing aids often include a plastic housing or shell 14. The shell 14 includes an interior surface 16, exterior surface 18, and hearing aid port 20. The interior surface 16 defines an interior cavity 22 of the shell 14.

The exterior surface 18 is exposed to a region 24 that is external to the hearing aid 12. The hearing aid port 20 extends between the interior and exterior surfaces 16, 18 of the shell 14. The port 20 is cylindrically shaped, having a length between the internal and external surfaces 16, 18 of approximately 1.5 mm and a diameter of about 2.8 mm.

In the preferred embodiment, the interior cavity 22 of the shell 14 contains components for the hearing aid 12, such as a receiver 26, sound channel 28, and filler material 32. The receiver 26 includes a protuberant output port 30. Sound is emitted from the receiver 26 through its output port 30. The filler material 32 substantially fills a portion of the interior cavity 22 and cradles the receiver 22.

95 The sound channel 28 is a hollow, substantially cylindrically-shaped passageway. The sound channel 28 interconnects the output port 30 of the receiver 26 with the hearing aid port 20. It may be formed, for example, either by a tube or, as in the preferred embodiment, by the absence of filler material 32 between the output port 30 and hearing aid port 20.

100 The sound channel 28 defines a centre line 34 between the output port 30 of the receiver 26 and hearing aid port 20. The centre line 34 is in the very middle of the sound channel 28 and is shown as being straight. The sound channel 28 may be formed in a variety of non-straight shapes, of course, and the centre line 34, extending down the middle of the sound channel 28, would then also assume a non-straight shape.

110 In the preferred embodiment shown in *Figure 3*, the cross section of the sound channel 28 is perpendicular to the centre line 34 and has a predetermined, circular shape. The diameter of the circular shape is approximately 1.3 mm.

The ear piece also includes a pliant, porous structure, hereinafter referred to as a porous guard 36, and retainer cup or ring 38. The pliant guard 36 is comprised of a cylindrical disc of open cell polyurethane. While a large variety of such foams will prove suitable for use with the present invention, applicants have discovered that Scott Industrial Foam, manufactured by the Foam Division of the Scott Paper Company, 1500 East Second Street, Chester, Pennsylvania 19013, functions satisfactorily.

125 Such foam having a density of approximately 30 pores per linear cm has been found acceptable.

130 The foam is capable of allowing sound to pass

therethrough without substantial interference and still resist the flow of wax therethrough. Moreover, the soft, light, pliable nature of the foam makes it well-suited for use within the human ear. Even if 5 dropped within the ear, its pliability will substantially resist irritating or abrading the skin or structures within the ear. Moreover, the foam is "chemically inert". Thus, it is not adversely affected by body acids, perspiration, or mild soaps.

10 In the preferred embodiment, the cylindrical, pliant guard 36 has a thickness (between the interior and exterior surfaces 16, 18 of the shell 14) of approximately 0.8 mm. The pliant guard 36 also has a diameter (or cross-sectional dimension) of 15 approximately 2.0 mm.

The pliant guard 36 is inserted in the hearing aid port 20 abutting both the sound channel 28 and filler material 32 within the interior cavity 22 of the shell 14. Since the pliant guard 36 has a cross-sectional dimension (diameter) 0.8 mm larger than the cross-sectional dimension (diameter) of the sound channel 28, the pliant guard 36 resists moving into the sound channel 28 or output port 30 of the receiver 26.

25 The entire retainer ring 38 has an outside diameter of roughly 2.8 mm and is affixed to the hearing aid port 20 substantially between the pliant guard 36 and external region 24. The retainer ring 38 may be permanently affixed by gluing it in the hearing 30 aid port 20 with a strong glue 40 such as a cyanoacrylate ester.

In the preferred embodiment, the retainer ring 38 is a unitary, substantially ring-shaped device. For purposes of illustration, however, the retainer ring 35 38 may be considered as having both an upper region 42 adjacent the sound channel 28 and filler material 32 and a lower-region 44 adjacent the external region 24. The upper region 42 is approximately 0.8 mm thick (which is roughly the same 40 thickness as the pliant guard 36) and defines a central aperture 46 that is approximately 2.0 mm in diameter (which is roughly the same diameter as the pliant guard 36). Thus, the pliant guard 36 lies within the central aperture 46 of the upper region 45 42 of the retainer ring 38.

The lower region 44 of the retainer ring 38 abuts the upper region 42 and is also approximately 0.8 mm thick. The lower region 44, however, defines at least one central aperture 48 that is only 1.5 mm in 50 diameter. The upper and lower regions 42, 44 of the retainer ring 38 may thus cooperatively define a catch 50 for preventing the pliant guard 36 from slipping out of the hearing aid 12 into the external region 24. Moreover, the lower region 44 of the retainer ring 38 also includes an outer, tapered edge 52 that is tapered away from the centre line 34 of the sound channel 28. The tapered edge 52 acts as a gradual transition from the central aperture to the external region 24.

60 In operation, the hearing aid 12 is inserted into the canal of the user's ear with the hearing aid port 20 pointing toward the ear drum. Sound is emitted from the receiver 26 through the output port 30. The sound passes through the sound channel 28 65 and through the pliant guard 36 into the external

region 24, which includes the user's ear canal and ear drum.

Earwax may flow into the hearing aid port 20, but is substantially prevented from entering the 70 sound channel 28 and output port 30 of the receiver 26 by the pliant guard 36. Instead, the pliant guard 36 collects the wax.

After the pliant guard 36 has collected wax, the hearing aid 12 may be removed from the ear. An 75 implement, such as a simple tweezers (not shown), may then be inserted into the hearing aid port 20 to grab onto the pliant guard 36 and remove it. The soiled pliant guard 36 may then be disposed of and a fresh, new pliant guard 36 may be inserted into the upper region 42 of the retainer ring 38. The hearing aid 12 is then ready for continued use without fear that earwax will enter the receiver 26 to clog or destroy it.

80 A preferred embodiment of the present invention 85 has been described herein. It is to be understood, however, that changes and modifications can be made without departing from the true scope and spirit of the present invention.

For example, the thickness and density of the 90 pliant guard 36 may be changed so that it will modify or dampen, in a predetermined, desired manner, the sound emitted from the hearing aid 12. In addition, the preferred embodiment previously described shows the shell 14 and retainer ring 38 as being separate elements. Those of ordinary skill in the art will quickly recognize, for example, that the shell 14 and retainer ring 38 could also be made as a single, unitary construction. The true scope and spirit of the invention are defined 95 by the following claims and their equivalents, to be interpreted in light of the foregoing specification.

#### CLAIMS

- 105 1. A hearing aid ear piece comprising a shell having an exterior surface and an interior surface about an interior cavity, a hearing aid port between the exterior and interior surfaces, a receiver within the cavity, the receiver having an acoustic output port, a sound channel between the ports, a pliant guard in the hearing aid port allowing sound to pass and substantially preventing wax from passing along the sound channel, retainer means around the hearing aid port to retain the guard in the hearing aid port and to allow removal of the guard from the hearing aid port.
- 110 2. An ear piece as claimed in Claim 1 wherein the end of the sound channel towards the exterior of the shell has a cross-sectional area less than the guard and wherein the retainer means has a guard abutting surface.
- 115 3. An ear piece as claimed in Claim 1 or 2 wherein said retainer means has inner and outer regions, the outer region substantially adjacent the exterior shell surface and encompassing a first aperture having a cross-sectional area less than that of the guard, the inner region substantially adjacent the interior cavity and encompassing a second aperture having a cross-sectional area greater than the cross-sectional area of the first aperture.
- 120
- 125
- 130

4. An ear piece as claimed in any one of Claims 1 to 3 wherein the pliant guard is formed from open cell polyurethane foam.
5. An ear piece as claimed in any one of Claims 1 to 4 wherein the retainer means is a ring fixed within the hearing aid port.
6. An ear piece as claimed in any one of Claims 1 to 4 wherein the retainer means is formed by the shell.

10 7. A hearing aid ear piece substantially as described with reference to the accompanying drawings.

---

Printed in the UK for HMSO, D8818935, 7/85, 7102.  
Published by The Patent Office, 25 Southampton Buildings, London,  
WC2A 1AY, from which copies may be obtained.